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The following information has been extracted from the documents submitted by the applicant:

(54) Process and device for the sorting of components

(57) This invention relates to a novel process for sorting components, especially flat or disc-type components that are on the first front face fluted and on the opposite second front face unfluted or only slightly fluted in comparison to the first front face.

Description

[0001] The invention relates to a process for sorting components, especially flat or disc-shaped components according to the preamble patent claim 1, as well as to a device for implementing this process according to the preamble patent claim 7.

[0002] "Flat or disc-shaped components" in the meaning of the invention, having two opposite front faces or sides, whose separation distance is smaller than the diameter of the respective component in a cross-sectional plane perpendicular to the axis, by which the two front faces are separated from one another.

[0003] Components in the meaning of the invention, especially those that will be processed or treated in a mechanical manufacturing process, especially also nuts or so-called punch nuts that are inserted into assembly parts made of sheet metal of flat stock and anchored there, for example, by a permanent deformation of the material.

[0004] For the mechanical processing of such punch nuts or other components, it is

necessary to convey these components to the respective processing station, e.g., a punch head, in a specified alignment, i.e., the components, if they are conveyed from a stockpile that contains the components as an unsorted pile, they must be sorted in such a way that only correctly aligned components will reach, by an appropriate conveying route, the processing station, while misaligned components will be returned to the stockpile. For this purpose, as an example, there are known conveying routes with appropriate baffles, at which misaligned components are ejected. Also known is the scanning of the alignment of components on conveying routes by means of sensors and then ejecting or blowing out the misaligned component at a subsequent ejection point by briefly switching on a compressed-air discharge nozzle. These known techniques are in many cases very costly and also assume that the components have a distinctive form that can be clearly detected by a baffle or by a sensor.

[0005] The problem of the invention is to show a procedure by which the sorting of components is possible in a very simplified way. To solve this problem, a process according to patent claim 1 has been developed. A device for performing the process is constructed according to patent claim 7.

[0006] According to the invention, sorting the components under application of Bernoulli's law takes place in that the components are arranged upright, i.e., with their front faces in a vertical or near-vertical plane and move past an ejection position, supported at the circumference on a support surface in an unstable or nearly unstable equilibrium, past which the components move or are in close contact, with their first or second front face close to a second support surface, and on which a gap is formed by compressed air or a stream of pressurized gas between the second support surface and the neighboring front face of the component. If the components are misaligned here, i.e., if they are resting with their first strongly convoluted front face against the second support surface, the gap between the second support surface and the neighboring front face of the component forms a relatively large streaming cross-section for the air or gas stream and the respective misaligned component is ejected by the compressed air or the pressurized gas. If a component is correctly aligned, i.e., if the component rests with its second front face against the second support surface, the gap between the second support surface and the neighboring front face of the components creates a flow cross-section for the air or gas stream that is strongly reduced by the lack of fluting of the second front face, so that by the consequently increased flow rate of the compressed air or pressurized gas in said gap, a negative pressure is created that holds the component in the conveying route, the properly aligned component thus passes the sorting and ejection position without being ejected.

[0007] The compressed air is permanently switched on, i.e., with the process according to the invention, and it is unnecessary to detect the respective orientation of the components before the sorting and ejection positions by sensors and then to control the media provided at the ejection position for ejecting the wrong components. The

invention enables the sorting of components in a specially simple manner.

[0008] Further developments of the invention are the subject of the subordinate claims. The invention is explained in greater detail below on the basis of the figures in a practical example. The following is shown:

[0009] Fig. 1 shows, for example, a nut in a very simplified illustration;

[0010] Fig. 2 shows a device for processing the components in a very simplified illustration;

[0011] Fig. 3 shows a section through a conveying route for conveying the components of Fig. 1 when the component is properly aligned, in a very simplified illustration; and

[0012] Fig. 4 is an illustration like Fig. 1, but where the component is misaligned.

[0013] In the figures, 1 is a component, that is, a nut (punch nut) in the demonstrated form of execution, which is intended for fastening of an assembly part 2 made of flat stock, e.g., sheet steel, which is, e.g., part of a car body. Nut 1 is anchored in a known manner in an opening of assembly part 2 by deformation or pressing the material of assembly part 2.

[0014] Component 1 consists of a body 3, forming on one side 1' a flat front face 4 and on the opposite side 1" a projection 5 by which the component 1 is anchored in the assembly part 2.

[0015] For the mechanical joining and anchoring of the components 1 in the assembly parts 2, the components 1 must be fed in a specified alignment to the appropriate tool, that is, the one designated in Fig. 2 as "punch head" 6, which is located in a press (not shown) and with which the joining and pressing of the components 1 into the assembly parts 2 takes place. A punch head of this type is described, for example, in DE42 25 282 A1.

[0016] For feeding the components 1, they are placed as an unsorted pile into a conveyor or vibratory feeder 7, which performs in a known way an oscillating movement around its vertical axis VA and which is fitted on its inside with a helically ascending conveying route 8 that encloses the oscillating axis, on which the components 1 are moved on the top edge of the vibratory feeder and are fed from there through another conveying route 9 to the punch head 6. At the same time, it is necessary that the components 1 fed to the conveying route 9 are aligned in a specific way with regard to the position of the front face 4 and the projection 5, i.e., components 1 that do not have the correct aligment are ejected from the conveying route 8 and are thus returned to the existing stockpile in the vibratory feeder 7.

[0017] Figs. 3 and 4 show details of the helical conveying route 8 of the vibratory feeder 7. This conveying route is essentially formed by a lateral support surface 8', which is a part of an imaginary conical surface enclosing the vertical axis VA as well as by a support surface 8" that projects stepwise into the inside of the vibratory feeder 7, which runs on an imaginary helical line around the axis VA, in parallel or nearly in parallel to the respective radius of axis VA. The conical angle of the support surface

8' is designed to be relatively small and so that a component 1 that is situated on the conveying route 8 and is then supported by the breadth 1''' of its component body 3 on the lower support surface 8", is aligned with its front face 4 in a plane that deviates only slightly from a vertical plane, or forms with the vertical plane only a very small angle, which is selected so that the respective component 1 is just sufficiently supported in a labile equilibrium against the support surface 8', so as not to fall back from the conveying route 8 into the interior of vibratory feeder 7.

[0018] Due to the shape of the conveying route 8, the components 1 may only have two possible alignments, with which the components 1 can actually get to the top, via conveying route 8, into an ejection position 11 having a compressed-air exit orifice 10, that is, into the proper alignment shown in Fig. 3, in which the components 1 rest against support surface 8' by their planar or approximately planar front faces 4, or into misalignment shown in Fig. 4, in which the components 1 rest with their projection 5 against the support surface 8'.

[0019] The exit orifice 10 on the conveying route 8 is designed in the area of the support surface 8' in such a way that the orifice 10, when a correctly aligned component 1 moves past said outlet, will be covered up by said component by its front face 4, whereas whenever a misaligned component 1 passes by, the compressed-air orifice is free and opens out into a space or a gap 12, which on the top side of projection 5 that is averted from the lower support surface 8" is formed in the area by this projection 5 and the overlaying component body 3 and in which the flow cross-section for the compressed air escaping from the orifice 10 is larger than the flow cross-section of the orifice 10. From the space of gap 12 the compressed air enters the surroundings at a reduced flow rate. The compressed-air exit orifice 10 is connected through a compressed-air line 13 with a compressed-air source 14, which supplies a preferably, with regard to pressure and quantity, adjustable compressed air flow. This compressed air flow is adjusted with regard to quantity and pressure in such a way that it is adequate, in case of a misaligned component 1, for ejecting said component 1 from the conveying route 8.

[0020] When the component 1 is properly aligned, compressed air also escapes from the orifice 10, but from a very narrow gap 15, formed between the front face 4 of the component 1 and the support surface 8', and from there to the surroundings. Gap 15 forms, in comparison to space 12 a greatly reduced flow cross-section for the compressed air, so that a negative pressure is created by the high flow rate, which preventes ejection of the properly aligned component 1 back into the vibratory feeder 7, and retains the properly aligned component in the conveying route 8.

[0021] The described illustration of conveying route 8 or the ejection position 11 there, has the advantage that misaligned components 1 are ejected solely by the compressed air escaping from the orifice 10, without scanning the components 1 or their alignment by sensors, e.g., by photoelectric sensors, etc. In the process, compressed air escapes

continuously from the compressed-air orifice 10. The compressed air flow is not turned on or off.

[0022] The invention was described above by a practical embodiment. It is understood that numerous modifications and variations are possible, without abandoning the inventive conception on which the invention is based. Thus, it is, of course, possible to perform the above described sorting of the components 1 not only on the conveying route 8, formed within the vibratory feeder 7, but also on a different conveying route, for example, on a conveying route formed by a linear conveyor, which in turn has support or contact surfaces 8' and 8" positioned to one another at an angle appropriate for ejection or sorting position, and the air escape orifice 10 is at a distance above the lower support surface 8".

[0023] Further, the use of the conveying route according to the invention is, of course, not restricted to the form described above, but can be generally used for components 1 which on one side form an essentially planar surface and are fluted on the other side, are provided for instance with at least a projection and are designed so that the distance between the two sides is smaller than the cross section at these two sides.

Reference list

1	component
1', 1"	side
1'''	breadth
2	assembly part
3	component body
4	planar front face of component
5	projection of the component
6	punch head
7	vibratory feeder
8	conveying route
8', 8"	support surface
9	conveying route
10	compressed-air exit orifice
11	sorting or ejection position
12	space
13	compressed-air line
14	compressed-air source
15	flow gap

Patent claims

1. Process for the sorting of components (1), especially flat or disc-type components that are fluted on the first front face (5) and not fluted on the opposite second front face (4) or only slightly fluted in comparison to the first front face, characterized in that the components (1) at a sorting or ejection position (11) are supported by a circumferential surface (1") against a first support or contact surface (8") and with the first or second front face in a vertical or nearly vertical plane aligned adjacent to a second support or contact surface (8'), that on the second support surface (8') a gas or air flow escaping from at least one exit orifice (10) is produced in such a way that this gas or air flow enters the environment through a gap (12, 15) created between the respective component (1) and the second support surface (8'), the (gap) in case of a misaligned component (1) through the fluting of the first front face has a larger flow cross-section than in the case of a properly aligned component (1) and that the compressed air or pressurized gas flow is adjusted so that properly aligned components (1) are held by negative pressure according to Bernoulli's law in the sorting or ejection position (11) while misaligned parts are removed due to the absence of negative pressure from the sorting or ejection position (11).

2. Process according to claim 1, characterized in that the sorting or ejection position (11) is formed on a conveying route (8).

3. Process according to claim 1 or 2, characterized in that the components (1) have a projection (5) on their first front face.

4. Process according to any of the above claims, characterized in that the second front face of components (1) are planar or essentially planar in form.

5. Process according to any of the above claims, characterized in that the components are nuts, for example, punch nuts (1).

6. Process according to any of the above claims, characterized in that the orifice for compressed air is provided at a distance before the first support surface (8").

7. Process for the sorting of components (1), especially flat or disc-type components that are on the first front face (5) fluted and on the opposite second front face (4) not fluted or only slightly fluted in comparison to the first front face, characterized in that the components (1) at a sorting or ejection position (11) are supported by a circumferential surface (1"') against a first support or contact surface (8") and with the first or second front face in a vertical or nearly vertical plane aligned is adjacent to a second support or contact surface (8'), that on the second support surface (8') a gas or air flow escaping from at least one exit orifice (10) is produced in such a way that this gas or air flow enters into the surroundings through a gap (12, 15) produced between the respective component (1) and the second support surface (8'), the (gap) in case of a misaligned component (1) through the fluting of the first front face has a larger flow cross-section than with a properly aligned component (1) and where the compressed air or pressurized gas flow is adjusted so that properly aligned

components (1) are held by negative pressure according to Bernoulli's law in the sorting or ejection position (11) and misaligned parts are removed due to the absence of negative pressure from the sorting or ejection position (11).

8. Process according to claim 7, characterized in that the sorting or ejection position (11) is created on a conveying route (8).

9. Process according to claim 7 or 8, characterized in that the components (1) have a projection (5) on their first front face.

10. Process according to any of the above claims, characterized in that the second front face of components (1) is planar or essentially planar in form.

11. Process according to any of the above claims, characterized in that the components are nuts, for example, punch nuts (1).

12. Process according to any of the above claims, characterized in that the orifice for compressed air is located at a distance before the first support surface (8").

2 pages of drawings are attached.

Fig.1

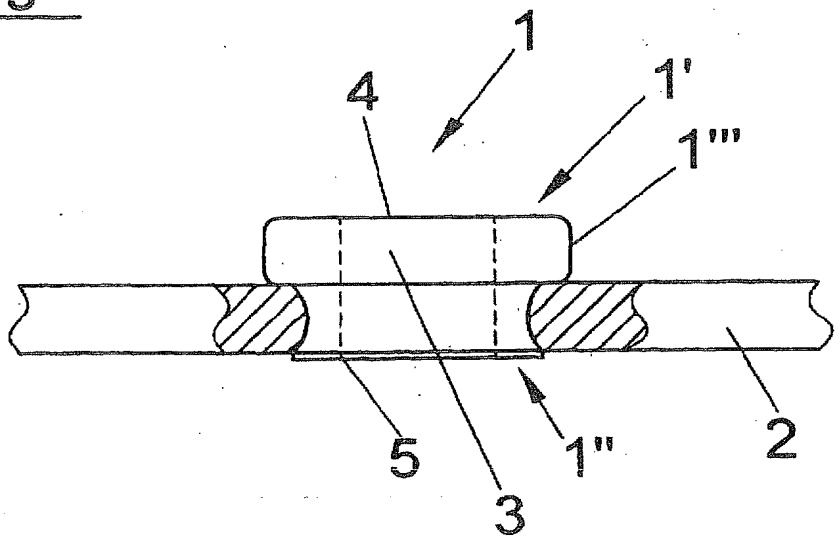

Fig.2

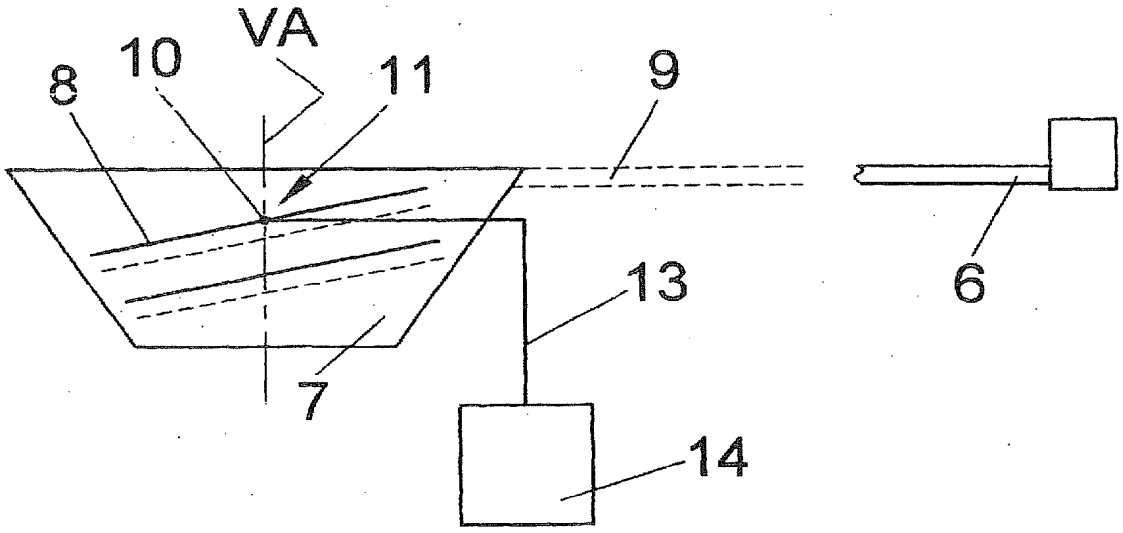

Fig.4

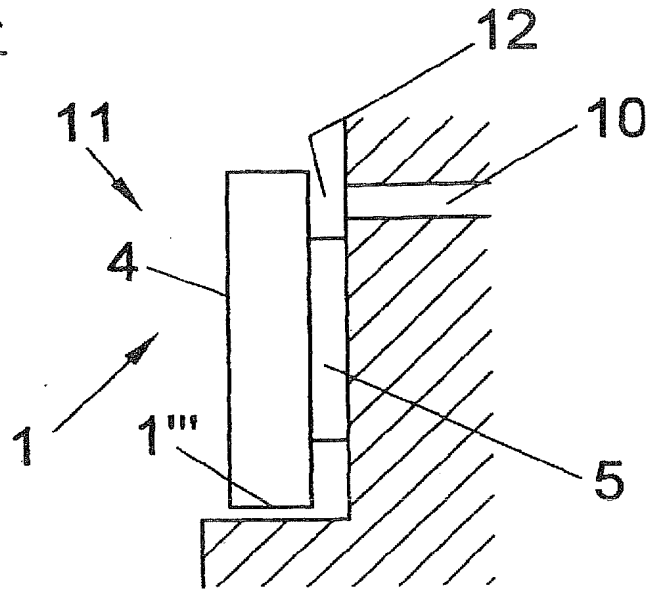

Fig.3